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[To be continued.]

XLII.—*On the Urari, the Arrow Poison of the Indians of Guiana; with a description of the Plant from which it is extracted.* By ROBERT H. SCHOMBURGK, Esq.*.

MORE than two centuries have elapsed since the curiosity of Europe was raised to become acquainted with the plant from the juice of which the Indians make their celebrated Urari poison; and as the preparation has been enveloped in great mystery, all the attempts hitherto made have only added considerably to the wish of the learned in Europe to be able to sift the true from the fabulous accounts.

Raleigh appears to have been the first who heard of this substance, with which the Aborigines poisoned their arrows for war and the chase; and Father Gumilla observes, that "its principal ingredient was furnished by a subterraneous plant, a tuberosc root, which never puts forth leaves, and which is called the *root* by way of eminence, *raiz de si misma*; that the pernicious exhalations which arise from the pots cause the old women to perish who are chosen to watch over this operation; finally, that these vegetable juices never are considered as sufficiently concentrated till a few drops produce at a distance a repulsive action on the blood. An Indian wounds himself slightly, and a dart dipped in the liquid Curare is held near the wound; if it makes the blood return to the vessels without having been brought into contact with them, the poison is judged to be sufficiently concentrated." Not less eccentric are the accounts which we receive from Hartzinck†, who was informed that, in order to try whether the poison be good, a poisoned arrow is shot into a young tree; if the tree shed its leaves in the course of three days the poison is considered strong enough. He observes further, that in the last rebellion of the Negroes in Berbice, a woman

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who carried her child on her back was shot with a poisoned arrow, and though the child was not wounded, it began to swell, and died a short time after.

At the commencement of the 19th century Baron de Humboldt gave an authentic account of the preparation of that poison and its effects; but later travellers, not contented with the simple method of its preparation, covered it anew with the veil of mystery, and it was thought that "the vegetable extract was merely the medium through which the poison is conveyed—the common Wooraly owing its poisonous quality to the infusion of the large ants, called Muneery, and the stronger kind from the fangs of venomous reptiles, particularly the Coony Coochy, which is the most venomous of all known snakes*." The author of 'Wanderings in South America,' Mr. Charles Waterton, gives a similar account of its preparation. He says, "a day or two before the Macoushi Indian prepares his poison, he goes into the forest in quest of the ingredients. A vine grows in these wilds, which is called Wourali. It is from this that the poison takes its name, and it is the principal ingredient. When he has procured enough of this, he digs up a root of a very bitter taste, ties them together, and then looks about for two kinds of bulbous plants, which contain a green and gelatinous juice. He fills a little quack which he carries on his back with the stalks of this, and lastly ranges up and down till he finds two species of ants. One of them is very large and black, and so venomous that its sting produces a fever: it is most commonly to be met with on the ground. The other is a little red ant which stings like a nettle, and has its nest under the leaf of a shrub. After obtaining these, he has no more need to range the forest. A quantity of the strongest Indian pepper is used, but this he has already planted round his hut. The pounded fangs of the Labarri Snake, and those of the Conna Couchi, are likewise added. These he commonly has in store; for when he kills a snake, he generally extracts the fangs, and keeps them by him †." This is the adorned story of the ingredients for the preparation of the Urari, and rests upon the fictitious accounts which these travellers may have received, but surely not upon personal experience.

These various accounts, so contradictory as regards the mode of preparation and the origin of the poison, were well calculated to raise in me the desire of removing the mystery connected with it; and I was fortunate enough to accomplish my wish during my first expedition in the interior of British

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After I had engaged some guides, I started, accompanied by Lieut. Haining of the 65th Regiment, in the morning of the 25th of December, in search of the mysterious plant. Our way led us first to the south, over pathless savannahs, until we met with a place in the Rupununi where we could ford it. As the mountains stretched their foot to the river's bank, we expected that the ascent would immediately commence. Our guide, however, led us through a mountain-pass, and before us was a large arid savannah. We turned now to the north, meeting with plains covered with wood, or low shrubs and coarse grass, bounded on both sides by the mountains; it was a wild road, crossed frequently by streams, some of which were dried up and others ran turbulently over numerous rocks: their banks were clothed with creepers and twiners, of the extensive families of *Convolvulaceæ*, *Bignoniaceæ* and *Eupatoriæ*: a beautiful reed raised its panicle high above the creeping plants; it was the *Gynerium saccharoides*, which the Indians use for their arrows.

At last, after we had walked more than five miles, the extent of the valley from the place where we entered it, the ascent commenced. It was by no means an easy matter: the path, Indian-like, quite narrow, led over fallen trees, between boulders of granite, and was often so steep that we had to use hands and feet. I wondered only how the Indians, with their burthens, could climb up. Mountain-streams had made their way over shelves of granite, forming frequent cascades, which during the rainy season must be grand indeed; at present, the water only trickled down the rugged sides, and was lost among numerous plants of the genera *Pothos*, *Heliconia*, *Gesneria*, *Peperoma* and *Canna*, which, favoured by the moisture, grew most luxuriantly. A *Justicia* with scarlet flowers, the beautiful *Petrea macrostachya* (β .), and the *Duranta* with its violet blossoms, added considerably to the beauty of the spot.

At three o'clock in the afternoon, after a most fatiguing march of eight hours and a half, we reached a few huts on Mount Mamesua, inhabited by Wapisianas, where we intended to rest for the night. We continued our inquiries, and learned from our host Oronappi, an old acquaintance,

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whom we had met a few weeks ago in the valley, that he himself knew how to prepare the poison, and that he would willingly accompany our guide and bring the plant for our inspection.

This proposal did not agree with my plans. I was anxious to see the plant in its native growth, and when we gave him to understand that it was our intention to accompany him, he attempted by signs to make us desist from going with him. He told us that the path was very bad, and that it was so far that we could not reach the place till afternoon, and that we would have to sleep on the road; he repeated the same story in the morning, and as he observed that we were determined to insist on our first plan, he made a sour face and did not speak for a length of time. Whether he thought that we were not able to stand the fatigues, or whether he wished us not to learn the place where the plant grew, I know not: enough of his stories—we found the first only true; the path was wretched; all traces of it were frequently lost, and an Indian only could have guided us; and he directed his course mostly by broken branches, or marks cut in the trees, sometimes standing still for some moments to consider in which direction to turn.

Our path was over "hill and dale," mostly in a N.N.W. and N.W. direction. It became every moment wilder: we had to cross several mountain-streams, which flowed in deep beds, precipitating at their banks a ferruginous matter; underbush became scarce; it appeared as if Nature here delighted only in gigantic forms. Our Indians thought they had mistaken the track; but as we arrived at a stream which ran rapidly over the sloping ground, exhibiting granitic shelves, we observed that several paths united; and crossing the brook our guides stopped, and pointing to a ligneous twiner which wound itself snake-like from tree to tree, they called out "Urari," the name of the plant in the tongue of our guides*.

* Sir Walter Raleigh, in his table of names, rivers, etc. discovered in his second Guiana Voyage (Hakeluyt's Voyages, ii. 692), mentions even then, among the poisons used by the Indians of the Orinoco, the Qurari; and by that name it is almost exclusively called by the Indians of Guiana. The Caribs in pronouncing the *r* frequently exchange this letter with *l*, and it may thus have happened that the name Wurali has crept in. The Macusis, who are acknowledged to be the best manufacturers of this remarkable substance, call it decidedly Urari. The same name it bears among the Tarumas, Wapisianas, Aricunas, Woyawais, Atorais, and various other tribes of the interior whom I have visited. The substitution of the corrupted name Wurali is therefore, to say the least of it, gratuitous, and ought to be rejected. Von Martius and Von Spix, in their 'Travels in Brazil,' observe that, during their exploring tours up the Amazon, Yupura, Rio Negro, etc., they heard it pronounced Urari, but never Wurali. (See Reise in Brasilien München;

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My wish was thus realized; and that plant which Baron de Humboldt was prevented from seeing, and which was one of the chief objects of Mr. Waterton's 'Wanderings,' but without success, I now saw before me. Baron de Humboldt, with his usual sagacity, observes, "The danger of the Curare, as of most other *Strychnæ* (for we continue to believe that the *Mavacure* belongs to a neighbouring family), results only from the action of the poison on the vascular system*."

Though I did not find the plant in flower, it was bearing fruit, and their inspection assured me that, as Von Humboldt suspected, the plant belongs to the genus *Strychnos*†. It forms No. 155 of my Guiana plants, and is thus characterized by Mr. Bentham:—" *Strychnos toxifera*, Schomb., Hook. Ic. Pl. t. 364 and 365; ramis scandentibus cirrhisque pilis longis patentibus rufis dense obtectis, foliis sessilibus ovali-oblongis acuminatis membranaceis trinerviis utrinque pilis longis rufis hirsutis, floribus fructibus maximis globosis.—Folia 3—4-pollicaria."

The *Strychnos toxifera*, as I have called it, the Urari of the Macusi and Wapisiana Indians, is a native of South America, and a sporadic plant; and, as far as known to us, has been hitherto found only in the granitic mountains of Canuku or Conocon, in latitude 3° 10' N., a group of mountains which border the extensive savannahs of the rivers Rupununi, Mahu and Takutu. It is a ligneous twiner: at its root, of the thickness of a man's arm, and covered with a rough ash-coloured bark, marked with fissures; winding itself to the neighbour-

1831, vol. iii. p. 1155.) The compound terms Uraricapara and Uraricuera (Parima), two rivers, the former the tributary of the latter, and which we find under these names in the oldest maps we possess of these regions, is another argument in favour of Urari. The arrow poison is generally known in England under the name of Wouraly, a name by which Mr. Waterton, in his 'Wanderings,' has described it; but interesting as his description may prove to the general reader, and however delightful the picture he draws of his various exploits, it is a work which never will be consulted as authority in scientific questions.

* Personal Narrative, vol. v. part ii. p. 527.

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My wish was thus realized; and that plant which Baron de Humboldt was prevented from seeing, and which was one of the chief objects of Mr. Waterton's 'Wanderings,' but without success, I now saw before me. Baron de Humboldt, with his usual sagacity, observes, "The danger of the Curare, as of most other *Strychnæ* (for we continue to believe that the *Mavacure* belongs to a neighbouring family), results only from the action of the poison on the vascular system*."

Though I did not find the plant in flower, it was bearing fruit, and their inspection assured me that, as Von Humboldt suspected, the plant belongs to the genus *Strychnos*†. It forms No. 155 of my Guiana plants, and is thus characterized by Mr. Bentham:—" *Strychnos toxifera*, Schomb., Hook. Ic. Pl. t. 364 and 365; ramis scandentibus cirrhisque pilis longis patentibus rufis dense obtectis, foliis sessilibus ovali-oblongis acuminatis membranaceis trinerviis utrinque pilis longis rufis hirsutis, floribus fructibus maximis globosis.—Folia 3—4-pollicaria."

The *Strychnos toxifera*, as I have called it, the Urari of the Macusi and Wapisiana Indians, is a native of South America, and a sporadic plant; and, as far as known to us, has been hitherto found only in the granitic mountains of Canuku or Conocon, in latitude 3° 10' N., a group of mountains which border the extensive savannahs of the rivers Rupununi, Mahu and Takutu. It is a ligneous twiner: at its root, of the thickness of a man's arm, and covered with a rough ash-coloured bark, marked with fissures; winding itself to the neighbour-

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As already observed, the plant was not in flower in December, and had just begun to drop its fruit, which were on long stalks; and the rudiments of a five-cleft calyx and an inferior corolla were easily perceptible.

The fruit is a berry of the size of a large apple, being frequently twelve inches in circumference; it is globular, and covered with a smooth hard rind of a bluish green colour and filled with a soft jelly-like pulp, in which the seeds, ten to fifteen in number, are immersed. They are round, concavo-convex, about an inch in diameter, and five to six lines thick; from the circumference five rays extend towards the prominence in the middle. They are of a grey colour and rough; the internal kernel is a yellowish white, and tough, like horn. This substance, according to Indian information, possesses intense bitter and medicinal properties; it is used by the Indians against pain in the stomach, dysentery, and as a tonic.

We observed many heaps of the cut wood covered with palm-leaves, which we were told had been left by the Macusis, who come to this place from a great distance, as the plant is known to grow only in two or three situations at the Canuku mountains; they are therefore resorted to by the Indians from all quarters.

The Wapisianas and Macusis are generally acknowledged to be the best manufacturers of the poison; and from the corroborative testimony of these tribes, I have gathered the following particulars respecting its preparation.

It is only the bark of the woody parts and its alburnum

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which are considered to possess the poisonous principle in the highest degree. The stem of the plant is therefore cut into pieces about three feet in length, of which the bark is stripped, and after having been pounded it is steeped in water, for which purpose a new earthen vessel is used; here they allow it to remain for some time, well covered, until the water is of a yellowish colour, when it is filtered through a funnel-shaped matappa lined with plantain-leaves. Several other plants have been meanwhile procured, and after their juice has been extracted in a similar manner, this extract is kept ready to be added to the former at the moment it has been concentrated on a slow fire to the consistency of a syrup. The addition of that juice gives a darker colour to the Urari, which, from the time of its becoming concentrated, has the appearance of tar: it is now put into small calabashes, which are covered with leaves to prevent the poison from coming in immediate contact with the air. The Indians pretend, that if it be well preserved it will keep its strength for a couple of years. If it is to be used, the quantity required is put into a separate calabash, and a little juice of the Cassada is added to it to make it more pliable. I was told that the addition of Cassada-water (as the expressed juice of the poisonous root of the *Jatropha manihot* is termed) reawakens the slumbering powers of the poison. After that juice has been added to it, the Indian buries the calabash with the poison for a day or two under ground.

This is the unadorned account of the preparation of the Urari, and the method which is followed by the Macusis at and about Pirara, and the Wapisianas of the Canuku mountains, where the plant grows. There appears to be no danger whatever in the preparation, and the vapours which are disengaged are entirely innocent; but the circumstance that it requires several days to watch the pot closely on the fire and to take off the scum, etc. before it is properly concentrated, as well as the superstitious customs with which the poison-maker, for his own advantage, surrounds the preparation of it, prevent the Indian, with his natural indolence, from making it more than once or twice a year.

I undertook in 1837 another expedition in the interior of Guiana, and found opportunity to revisit the regions which, in consequence of the arrow poison, had been previously of interest to me. That interest had not been abated—nay, it was increased. The belief continued to prevail among the colonists of Demerara, that the active poison of the Urari was “snake-teeth and stinging ants;” and my assertions, that the vegetable juice of the plant employed produced the

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fatal effect, and that it contained no animal principle, were doubted. It became evident that the more mysterious accounts of former authors had taken too firm a root to give my plain tale a chance of finding credit. It was certainly true I had not been present at the time of preparation, and although in my own mind I doubted not the Indian's information, I could not implant that faith into others. During our stay in Pirara, a Macusi village on the classical soil of Raleigh's and Keymis's El Dorado, I ascertained that an Indian lived in the vicinity, who was far-famed for the preparation of the Urari poison. I induced him by presents of some consideration to prepare it in my presence, and he promised to do so. I accompanied him for that purpose to the Canuku mountains, partly with the object of being present at the gathering of the chief ingredient, and partly to see whether I might be fortunate enough to find the plant which is called Urari in blossom. In the latter object I was disappointed: I found it again, as during my first visit, fruit-bearing.

The mountain Ilamickipang had been named as the place nearest to Pirara where the plant grew, being about eighteen miles distant in a south-eastern direction from the spot where we collected it in 1835. We ascended the mountain for about 1500 feet, and though we observed numerous Urari plants at a less height, our sapient chemist, after having tried different pieces of the stem, pronounced it not to be in a state fit for preparation. After we had reached a saddle of the mountain, a spot was selected, where, with the assistance of our Indians, we built a hut of palm-leaves, and from hence short excursions in different directions were undertaken, to collect such plants as possessed the sap in a high degree. They were found generally in rocky places or glens, among heaped-up boulders of granite, places well selected by a plant which is so fatal in its effects. The branches and ligneous stems, which were in thickness less than the human wrist, were chosen and carried into the hut, where they were scraped, and the bark was preserved in small baskets made for that purpose. Three such baskets were filled, when our chemist considered that he had enough, and the baskets were delivered up to me, and we returned to Pirara. The manufacturing of the poison was however delayed for some days, for the object, as I was told by the chemist, of observing previously a rigid fast, in order to prepare himself for the important business. Meanwhile Kanaima, an influential Macusi chief from the Rupununi, arrived on a visit in Pirara, and for what purpose I know not: it is enough to state, that he knew how to prevail so far upon the manufacturer of the poison that he re-

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tracted his promise, and refused to prepare it in my presence. However, the bark was in my keeping, and as I had paid for it, I considered myself to have a full right to it; and although he demanded it back, it was now my turn to refuse him. We were at that period so near our departure for Fort San Joaquin, that I was prevented from engaging a more willing concocter, and with the pure bark in my possession we departed.

The dreary "winter season," as the time when the tropical rains descend in torrents is called by the Brazilians, gave me sufficient leisure to enter into further inquiries with regard to this poison, and I resolved to make some experiments how far the pure bark of the Urari plant, *Strychnos toxifera*, unmixed with any other substance, might prove fatal to animal life. I took, therefore, two pounds of the bark shavings, and having poured a gallon of water on it, allowed it to remain in that state for twenty-four hours. Half of it was filtered off, and keeping a steady but gentle coal fire, it was boiled in a new pot, adding from time to time more of the infusion. After having concentrated it by boiling to the consistence of thin syrup, and having allowed it to cool, two arrows were poisoned with this substance, and two fowls wounded, one in the thigh and the other in the neck. The effects became apparent after five minutes: the first died in twenty-seven minutes after the wound had been inflicted; and the latter, which had been wounded in the neck, after twenty-eight minutes. The gentleman who accompanied me on my expedition, and Senhor Pedro Ayres, who had been sent by the commander of the district to welcome us at the Brazilian boundary, were present during these experiments, and it is therefore established beyond doubt, that the Urari plant alone, without any assistance of Indian charlatanism, or the addition of extraneous substances not likely to add to its efficacy, produces the fatal effect. The boiling process was finished in less than seven hours, while the Indians employ more than forty-eight hours for that purpose; and as it required a period rather longer to produce death in the fowls wounded with it than would have been necessary with good Macusi poison, this must be ascribed to our decoction being not sufficiently concentrated. The poison which I had thus prepared was of a brownish colour: good Macusi poison is jet-black, and I have no doubt that it receives this appearance from one of the ingredients which the Indians add to it.

When I left Pirara, foiled in my purpose to see the poison prepared by the Macusi, I arranged with the Rev. Thomas Yond, who laboured then as missionary of the episcopalian

tracted his promise, and refused to prepare it in my presence. However, the bark was in my keeping, and as I had paid for it, I considered myself to have a full right to it; and although he demanded it back, it was now my turn to refuse him. We were at that period so near our departure for Fort San Joaquin, that I was prevented from engaging a more willing concocter, and with the pure bark in my possession we departed.

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church in that village, to try if he could induce any of the famed poison-makers to boil it in his presence; and although, on my return to Pirara in 1839, I had at last an opportunity of witnessing the preparation of the poison by my former recreant Macusi, I nevertheless prefer inserting here Mr. Yond's letter, as it is an additional evidence for henceforth rejecting "snake-teeth, stinging ants," etc. as component parts of the Urari poison.

" To Robert H. Schomburgk, Esq.

" Pirara, 4th October, 1838.

" My Dear Sir,

" Knowing as I do that your object in visiting these wilds is that of making general research, for the information and benefit of society at large, I take the present opportunity of presenting you with the promised statement of the manner how, and the ingredients from which, the much-famed Urari poison is made, of which there has been so much conjecture and erroneous accounts given in time past.

" Since the time that I have come to reside amongst the Macusi Indians as missionary, curiosity has led me to go to a little expense in procuring one of the Indians from the Canuku mountains, who is noted for his being able to make powerful poison, whom I prevailed upon to boil a quantity before me at the Mission House. I was fortunate enough in purchasing a quack or basket of Urari bark, as also a quantity of Arimāru, Tarireng, and Tararemu; the rest by Urari-maker procured in the space of three days. The ingredients being already procured, the next movement in course was the erecting of my tent, and enclosing three parts of it round with palm-leaves, which for the time being was called the Indians' Urari House. This temporary house was erected in the front enclosure, opposite the door, that I might see every movement. A buck-pot*, that would hold a little more than a gallon, and that had never been used, was then brought, as also four shallow plates: the first was to boil the ingredients in, and the others to expose the Urari liquid to the sun when boiled, in order to reduce it to a jelly.

" One large gooby†, stopped at the mouth or stall-end with loose cotton, was opened at the head-end sufficiently wide for admitting the contents of the Urari-pot through when poured out. A second small gooby was made, in the shape of a funnel, and stopped with silk grass, in order to pour the Urari through when moving it from one drying-plate to the other, that the scum which rises on the top during the time of drying might be kept back. The last receptacle is a small calabash‡, that will hold half a pint, into which the whole

* The earthen pots in which the Indians prepare their food, and which they manufacture themselves, are called in the colony buck-pots, buck being among the colonists a cognomen for Indian.—S.

† Gooby, the fruit of a species of pumpkin, which, after having been scoured out, is used in lieu of a flask.—S.

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of the Urary is poured by degrees through the small funnel, after it has been brought to the consistency of thin starch. As soon as all things were set in order, and the wood split up in readiness for making the fire, the man set off in search of I could not conceive what, and therefore I asked one standing near me why the man had gone away. He said, 'He is gone to fetch his tinder-box, to make fire, for he will not take a light from any person's fire; you will see he will make his own.' I waited awhile, and then he came with a tinder-box and steel in his hand. I looked at the box and tinder, to see if there was anything remarkable in it, but found it to be simply a roll of loose cotton wound round with thread, about an inch in diameter, and seven in length, having for its case a piece of bamboo of the same length, which aids in protecting the cotton from getting damp, and also serves as an extinguisher to the burning tinder when put downwards in the bamboo-case. Mulatto then took his red flint-stone, such as the Indians commonly use, which is found in some of the distant mountains, and seems to be just as good as our flint-stone at home for such a purpose*, and struck several times, but the cotton having by some means got rather damp, he could not succeed in getting a light: he then went to my kitchen and lighted his cotton-roller. Now I thought I should find that he would make his fire from this burning tinder, that had certainly got its spark from my kitchen fire; but no, instead of this he pushed it into his bamboo extinguisher, and let it remain there until every spark was put out. He then struck a light from his own flint, and so began making a fire. Other fire than that made by the Urary-maker is not allowed to come under the roof of the Urary-house, lest the whole should be defiled. Neither may any water be used in drawing or cooking the Urary but that which is procured by the Urary-maker, and even that must not be put in any vessel, save his own sacred goblets.

"Mulatto began boiling the Urary about eleven on Friday the 19th of September, 1838. The ingredients used are as follows:—

Urary† bark from a vine	2 lbs.
Arimarn bark ‡, vine	$\frac{1}{4}$ —
Tarireng	$\frac{1}{4}$ —
Yakkee	$\frac{1}{4}$ —
Wokarimo	$\frac{1}{4}$ —
Tararemu $\frac{1}{2}$ oz., from the root of the Tarireng vine	$\frac{1}{2}$ oz.
Muramu§, a bulbous root, not boiled, but soaked in the half-cooked Urary, and the slime is squeezed from it, to congeal the whole . . .	$1\frac{1}{4}$ lb.
Manuca , the bark of a large tree, four small pieces.	

* The red flint-stone here alluded to is compact quartz (jasper), which is found in the vicinity of Mount Roraima, and along the banks of the rivers Coko and Cukenam.—S.

† Urari, or *Strychnos toxifera*, Schomb.—S.

‡ Arimaru, *Strychnos cogens*, Benth.—S.

§ Muramu, a species of *Cissus*. I brought some of these roots with me, which have been planted with success at Messrs. Loddiges and sons, and at the Botanic Garden in Berlin.—S.

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“Of these, however, he had to make two separate boilings, on account of his pot being too small to contain the quantity of bark necessary at once, for each of which he took a day,—for the first almost the whole of Friday, and the second the greater part of Saturday. The Urary was the first ingredient that was put in the pot, and the rest he every now and then kept adding by little and little, until the whole was used. He kept but a slow fire during the whole time of cooking, just sufficient to keep the liquid in a simmering state, which seemed to suck the virtue out of the bark well. Upon each additional handful of bark that he put in the pot during the time of cooking, he took special care to blow, informing me that that would give virtue to the Urary and make it strong. Of course I did not deem that to be a proper time for giving my opinion as to its real value or not, knowing that a little opposition would soon make him leave his work altogether, and I should be left with the ingredients unboiled, to muse over my own folly; I therefore told him he was welcome to do as he pleased, my only desire being to see everything that was done, and that the Urary should be strong, or painful as they term it. The whole of these two days (Friday and Saturday) had simply been to draw the poison out from the mixed quantity of bark, so as to form the Urary liquid, which in appearance was not unlike strong-drawn coffee. The whole liquid, consisting of a gallon and a half when first drawn, by this time had been reduced to about a quart, which was then poured into a gooby, the head of which had been cut out, and the tail-end stopped up with loose cotton, sufficiently tight to stop any thick sediment from passing through, acting as a sort of strainer, through which it passed into a large shallow plate and the pot which he had been using, in order to be exposed to the sun. This was on Monday morning. In course of two or three hours after the Urary had been exposed to the sun, I observed the powerful effect which the slime from the bulbous root Muramu* had in perceptibly congealing the liquid to a jelly. On Tuesday Mulatto began to pour the Urary into the more shallow plates, where it remained still exposed to the sun, until brought, as already stated, to the consistency of thin starch, and was from thence removed to the last receptacle, a small calabash, capable of containing near half a pint, to which small quantity the whole was brought.

“This process of drying continued from Monday until Thursday following, when Mulatto gave it over to me. Mulatto then asked me to come and see him try its strength, informing me that the first creature upon which it must be tried was a Tāpooya (a species of lizard found amongst the grass in the savannahs); for if it quickly

to belong to the *Xanthoxylaceæ*. It is said to have the quality of salivating when taken internally, and the inhabitants of the Rio Negro and the Amazon use it therefore in syphilitic complaints.

It is remarkable that all the ingredients which the Macusis use for the preparation of their poison are of an intense bitter. This may be the reason that it is used as a tonic. I am however unacquainted with the plants which they call Tarireng, Yakkee, and Wokarimo.—S.

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“Of these, however, he had to make two separate boilings, on account of his pot being too small to contain the quantity of bark necessary at once, for each of which he took a day,—for the first almost the whole of Friday, and the second the greater part of Saturday. The Urary was the first ingredient that was put in the pot, and the rest he every now and then kept adding by little and little, until the whole was used. He kept but a slow fire during the whole time of cooking, just sufficient to keep the liquid in a simmering state, which seemed to suck the virtue out of the bark well. Upon each additional handful of bark that he put in the pot during the time of cooking, he took special care to blow, informing me that that would give virtue to the Urary and make it strong. Of course I did not deem that to be a proper time for giving my opinion as to its real value or not, knowing that a little opposition would soon make him leave his work altogether, and I should be left with the ingredients unboiled, to muse over my own folly; I therefore told him he was welcome to do as he pleased, my only desire being to see everything that was done, and that the Urary should be strong, or painful as they term it. The whole of these two days (Friday and Saturday) had simply been to draw the poison out from the mixed quantity of bark, so as to form the Urary liquid, which in appearance was not unlike strong-drawn coffee. The whole liquid, consisting of a gallon and a half when first drawn, by this time had been reduced to about a quart, which was then poured into a gooby, the head of which had been cut out, and the tail-end stopped up with loose cotton, sufficiently tight to stop any thick sediment from passing through, acting as a sort of strainer, through which it passed into a large shallow plate and the pot which he had been using, in order to be exposed to the sun. This was on Monday morning. In course of two or three hours after the Urary had been exposed to the sun, I observed the powerful effect which the slime from the bulbous root Muramu* had in perceptibly congealing the liquid to a jelly. On Tuesday Mulatto began to pour the Urary into the more shallow plates, where it remained still exposed to the sun, until brought, as already stated, to the consistency of thin starch, and was from thence removed to the last receptacle, a small calabash, capable of containing near half a pint, to which small quantity the whole was brought.

“This process of drying continued from Monday until Thursday following, when Mulatto gave it over to me. Mulatto then asked me to come and see him try its strength, informing me that the first creature upon which it must be tried was a Tāpooya (a species of lizard found amongst the grass in the savannahs); for if it quickly

to belong to the *Xanthoxylaceæ*. It is said to have the quality of salivating when taken internally, and the inhabitants of the Rio Negro and the Amazon use it therefore in syphilitic complaints.

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kills that the Urary must be strong, because of its being hard to kill, having but little blood. I was at a loss to know how he would catch such a swift little creature in so awkward a spot, and how he would find them at all; but the mystery soon was revealed, for, having taken a torch in his hand, he set fire to the dry grass, which spread abroad and made the poor Tapooyas fly from their retreat, to hide in some distant tuft of grass or brushwood, which Mulatto keenly observed, and slyly pounced upon and secured them. He then took a small piece of wood, about the thickness of a stocking-needle, poisoned it at the pointed end with a little of the new-made Urary, and then stuck it in one of the hind legs of the lizard. He then let it loose, when it ran a few yards; then, panting, lay down and died. A second and third he pierced in the tail, upon which it had much the same effect; they both died in a few minutes. A rat was then brought in by one of the Indians, and its thigh was slightly pierced with a needle-like arrow, which had such an effect upon the poor creature as scarcely to allow it to move ten feet before it lay down and expired. I then proposed, as I was about having a fowl killed for dinner, to have it slightly touched with Urary on the leg: to this Mulatto made some objection, saying he never tried his Urary on fowls, and to do so would spoil the whole; but as I pressed it, he said, 'Then let it be done.' Mulatto then made a small arrow on purpose, drying it a little over the fire; for, said he, 'the Urary is yet soft, and it will strip off from the arrow as soon as it comes in contact with the skin; but if it be dried it will not, and will get to the blood.' The noble cock was then shot in the thigh, when it ran for ten or twelve yards, then walked across the road, of twenty yards wide, and lay down in the grass, when its head fell as though its neck had been broken, and he soon after died.

"I wished to have tried the effects of the Urary on a deer, or some other wild animal, but have not yet had an opportunity; however I doubt not, from what I have seen, of its being sufficiently strong to destroy any animal with which we are acquainted in a short time. Having heard in time past that snake-teeth were a necessary ingredient of the Urary, I asked Mulatto whether they were not (happening to have a few by me that had been taken from the head of a large rattle-snake that had been taken a few days before, which were at his service), but he said they were not at all necessary, that he never used them, nor would they assist much in making the Urary strong, since the Urary poison did not depend either upon them or the stinging-ant, and that for himself he used neither. Mulatto did not fail to act according to their superstitions, in abstaining from meats; also in requesting me not to eat or drink sugar when I came to see him*, and that no person or woman especially might come near the Urary-house; and even on the Lord's day would he not altogether cease to boil the Urary, but kept a few sparks alive under the pot, notwithstanding my request that he should do nothing during the sabbath. He would not as usual come into

* This superstition no doubt arises from their believing sugar to be an antidote to the Urary poison.—S.

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“I must now conclude, and beg your acceptance of the above observations, as coming from one who wishes you every success in your arduous undertaking, as also your welfare in general, both of soul and body.

“Remaining ever yours,

“T. YOND.”

Bancroft, in his ‘Natural History of Guiana,’ gives us a description of the manner in which the Acawais prepare the “Woorara,” as he calls it, which, in its general mode, agrees with Mr. Yond’s and my own observations. He distinctly says, “the ingredients are all ‘nibbees*’ of different kinds.” There is no doubt that different nations prepare their Urari in different modes, but the active principle subsists in one or the other species of *Strychnos*.

I have already alluded to Humboldt’s account of the mode of preparation at Esmeralda, at the time of his journey the place most famed at the Upper Orinoco for making the arrow-poison. Von Humboldt’s narrative is too generally known to demand a recital of his graphic account. However, Esmeralda is no longer what it was forty years ago; and when I visited it in 1839 I found it merely inhabited by an Indian patriarch and his family, who, on my inquiries, informed me that he bought his poison from the Indian tribes who inhabit the banks of the rivers Paramu and Ventuari, namely, the Guinaus and the Maionkonges. These tribes, who were known to the Spaniards under the name of Maquiritares, call their poison Cumarawa and Markuri, and distinctly make a difference between it and the Urari, which they gladly prefer in consequence of its superior quality, and which they barter from the Macusis and Arecunas, giving in return the Curata, that admirable reed, sometimes sixteen feet long without an internode, and of which the celebrated blow-pipes or Sarbacans are made †. From what I learned when amongst these

* Lianas, or ligneous twiners, are called nibbees or bushropes by the colonists.—S.

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Von Martius relates the mode of preparation of the Urari as practised by the Juris, Passes, Miranhas and Ticunas, Indian tribes of the Amazons and Yupura (vide 'Reise in Brasilien,' iii. pp. 1155 and 1235); and as he had opportunity to be present at the preparation while among the Juri Indians of the river Yupura, I insert here his remarks. "The chief ingredient of the arrow-poison of the Indians of the Yupura is furnished by a slender tree, the *Ronhamon Guianensis*, Aubl. (a *Strychnos*, L.), which in the Tupi tongue is called Urari-ïwa. The bark, after having been immersed in water, is pressed out by the Juri-Taboca with his hands, and the yellowish juice is concentrated in a flat plate, over a gentle fire, and other infusions extracted in a similar manner from the root of a pepper-shrub (*Piper geniculatum*); from a tree unknown to me, called Taraira-moira, that is, tree of the fish Taraira; the bark of a Cocculus plant (*Cocculus Juime*, M.), and a twining *Ficus*, are added in equal quantities. This compound extract, of the consistence of a thick syrup, had acquired over the fire a dark brown colour, when it was poured into small vessels, each containing about two ounces, and allowed to cool in the shade of the cabin. Previously, the Indian added to every vessel a small fruit of capsicum (Kiynha-avi), and with this the preparation of the Urari was finished. The Indians revive its strength when it has become weak, chiefly by adding the fruit of capsicum and the root of *Piper geniculatum*. There is little doubt that the extract of the four plants which have been named as additions are of less importance, and their place might be supplied by others. According to the information which I received from several Brazilians, other ingredients are added, namely, the milk of *Euphorbia* Mashiatti, Marawacca, and Wanaya, on the rivers Ventuari, Paramu, and Orinoco.

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teria veneficiorum*, M.; and superstitious Indians add the first
frog which they hear croaking that day, the great black ant,
or teeth of poisonous snakes." The addition of the teeth of
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in his 'Reise in Chili, Peru, und auf dem Amazonenstrom,'
Leipzig, 1836, vol. ii. p. 456, observes, with respect to the
arrow-poison of Peru, "The supposition occasionally met with
in Peru, that animal poisons were mixed in the composition,
has not met any confirmation."

M. Orfila, in his work on General Toxicology, M. Emmer
(*'De Effectu Venenorum veget. Americ.'*), and others, have
published able treatises on the effect of this poison. The re-
sults are, that when inspissated it may be rendered liquid by
heat, and is soluble in water, in alcohol, in muriatic acid, and
in volatile alkaline spirit. It unites with acids without emo-
tion or change of colour. If it be mixed with alkalis, no
ebullition is observable, but it changes its colour from a dark
brown to a yellowish brown. "A few grains, mixed with as
many ounces of human blood, warm from the veins, entirely
prevents a separation of serum and crassamentum, and the
whole mass continues in a state of fluidity similar to that in
which it is drawn, until, after some days, it putrifies." (Ban-
croft.) The poison affects chiefly the nervous system. Its
effect of destroying the vital-functions is considerably quicker,
as I have found by experiments, if it be brought in contact
with a vein; and I am of opinion that no sure remedy is
known as yet to counteract its effect, if it have entered the
blood in sufficient quantity. I have seen the deer arrested
in his fleet course, wounded by the poisonous arrow; I have
seen the tapir, while swimming across the Rupununi, so
slightly wounded that the spike had just penetrated through
the thick skin; nevertheless it took effect, and the animal ex-
pired. Numerous are the birds of larger and smaller size
which I have seen thus secured.

As much as I had heard of this fatal poison, I nevertheless
cannot abstain from noting the astonishment by which I was
seized when I saw it used for the first time. We travelled
over the savannahs girt by the Pacaraima mountains; a deer
was discovered browsing in the high grass before us. Lieu-
tenant Haining, of the 65th regiment, my faithful travelling
companion, was too far behind with his gun for us to await
his coming up, and one of the Macusi Indians took a poisoned

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in volatile alkaline spirit. It unites with acids without emo-
tion or change of colour. If it be mixed with alkalis, no
ebullition is observable, but it changes its colour from a dark
brown to a yellowish brown. "A few grains, mixed with as
many ounces of human blood, warm from the veins, entirely
prevents a separation of serum and crassamentum, and the
whole mass continues in a state of fluidity similar to that in
which it is drawn, until, after some days, it putrifies." (Ban-
croft.) The poison affects chiefly the nervous system. Its
effect of destroying the vital-functions is considerably quicker,
as I have found by experiments, if it be brought in contact
with a vein; and I am of opinion that no sure remedy is
known as yet to counteract its effect, if it have entered the
blood in sufficient quantity. I have seen the deer arrested
in his fleet course, wounded by the poisonous arrow; I have
seen the tapir, while swimming across the Rupununi, so
slightly wounded that the spike had just penetrated through
the thick skin; nevertheless it took effect, and the animal ex-
pired. Numerous are the birds of larger and smaller size
which I have seen thus secured.

As much as I had heard of this fatal poison, I nevertheless
cannot abstain from noting the astonishment by which I was
seized when I saw it used for the first time. We travelled
over the savannahs girt by the Pacaraima mountains; a deer
was discovered browsing in the high grass before us. Lieu-
tenant Haining, of the 65th regiment, my faithful travelling
companion, was too far behind with his gun for us to await
his coming up, and one of the Macusi Indians took a poisoned

cotinifolia, *Hura crepitans*, or the astringent fruits of *Guat-
teria veneficiorum*, M.; and superstitious Indians add the first
frog which they hear croaking that day, the great black ant,
or teeth of poisonous snakes." The addition of the teeth of
poisonous snakes and the great black ants, rests here, again,
not upon personal experience, but merely on the information
of Brazilians, no doubt equally inoculated as our colonists
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spike from his sarima* and fixed it to his arrow. Cautiously he stole upon the unsuspecting deer, and shot the arrow into its neck; it made a jump in the air, fled with the speed of the wind over the savannahs, but it had scarcely run forty yards when it fell panting to the ground, and expired. Von Humboldt has already related that its effect is more or less sudden upon different animals. If the poison be good and the arrow has entered a sufficient depth, it has effect upon the strongest bull in four to five minutes, while a fowl may resist it double that time. The Indians say that monkeys and jaguars are easier killed with it than any other animal.

The poison keeps its efficacy for a length of time. I brought with me at my return to Europe in 1839 a small calabash of the Urari, which had been made in May 1839 in my presence. I made several experiments with it in August 1840, and I found that it killed a rabbit in four to five minutes. Mr. Sewell, veterinary surgeon in London, whom we thank for several experiments to apply the Urari as a remedy in tetanus of horses, received through me some of the same poison, and found it effective. While in Potsdam I gave a small quantity to M. Desenis, who wounded several animals with it, and found that it deprived of life a rabbit in eight minutes, a cat in four and a half, and a pigeon in six minutes †. On dissecting the animals which had been killed by means of the Urari, it will be generally found that there are no signs of inflammation either in the lungs, stomach, or any other part, which, with regard to medical jurisprudence, proves this poison to be the more dangerous, as, should it be employed for sinister purposes by man against his fellow-creature, it would be difficult to say by a *post mortem* examination of what the victim died. In some of the rabbits on which I tried experiments, Dr. Franz found a large quantity of blood in the brain and the spinal cord.

I have already alluded to Mr. Sewell's experiments, who, viewing the lock-jaw in horses as the result of irritation, conjectures that "if a horse in tetanus were destroyed by poison, which acts by suppressing nervous power, and life were then to be restored by artificial respiration, the nervous system, on reanimation taking place, might possibly be free of the original morbid irritation." Reasoning thus, Mr. Sewell tried the following singular practice: "A horse suffering from a

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severe attack of the tetanus and lock-jaw, the mouth being too firmly closed to admit the introduction of either food or medicine, was inoculated on the fleshy part of the shoulder with an arrow-point coated with the Wourali poison; in ten minutes apparent death was produced. Artificial respiration was immediately commenced, and kept up about four hours, when re-animation took place; the animal rose up, apparently perfectly recovered, and eagerly partook of hay and corn. He unluckily was too abundantly supplied with food during the night. The consequence was over-distention of the stomach, of which the animal died the following day, without however having the slightest recurrence of tetanic symptoms." ('Outlines of Human Pathology.') From this experiment, which has been repeated, it was considered that it might be successfully applied in hydrophobia; and in a distressing case, where Inspector Phelps, of Nottingham, was suffering under this dreadful disease, Mr. Waterton, of Walton Hall, was requested to attend for the purpose of directing the operation. He came too late, as Mr. Phelps had expired before his arrival: but, for the advancement of general information, he, with his usual kind feelings, agreed to exhibit the experiment upon animals. The proceedings which were carried on before the surgical and medical profession at Nottingham have been detailed in the Nottingham Journal of 12th April, 1839, and have been since likewise printed in several periodical journals, where they may be referred to by those who feel interested in it. It was attempted during these experiments to restore by artificial respiration two asses, after they had been wounded with the Urari poison. The one first operated upon, although apparently recovered from the effects, died four days afterwards of debility: with the fate of the second I am not acquainted. However this may be, it becomes evident, that the Urari, in the present state of our knowledge of its effects, could only be resorted to in the greatest extremity as a remedy against hydrophobia, and where there is no hope of recovery.

The poison has been hitherto only to be procured with difficulty, as the Indians who manufacture it are not easily induced to part with it; but as I have fully ascertained that the effective principle is the bark of the *Strychnos toxifera*, and that the additional herbs are of less importance, and no doubt serve merely to mystify its preparation, it will become easy to any one to prepare the Urari, provided the bark be in his reach. It will likewise assist to draw the attention of the faculty to the chemical properties of the genus *Strychnos*.

According to M. Chevreul, the *Strychnos nux vomica* consists of acidulous malate of lime, gum, vegeto-animal matter,

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bitter matter, fixed oil, colouring matter, (which was yellow and probably starch, and which could not be directly extracted on account of its desiccation,) earthy and alkaline salts, woody hairs and wax, which latter appears to preserve the perisperm from humidity*. MM. Pelletier and Caventou have since discovered two vegetable alkalies, Strychnine and Brucine, in it.

It is known that where the Urari has not produced death, it has been followed by torpor and paralytic fits; and where it has taken effect, the victim dies under convulsions. It appears, when brought in contact with the blood, to have a direct power over the spinal cord. The same effect is produced by the nux vomica when taken internally. M. Orfila observes, "A person swallowed in the morning a scruple of nux vomica in powder, and drank afterwards a few glasses of cold water in order to diminish the bitterness occasioned by this substance. Half an hour after he appeared to be drunk; his limbs, especially his knees, were stiff and tense: his walk was staggering, and he was afraid of falling. He took some food and the symptoms disappeared. The administration of nux vomica and of the root of gentian to a woman affected with ague was followed by convulsions, cold and stupor, and almost every part of the body was torpid." (Scutter's Dissert. †)

It is remarkable that the poison proves innocent when taken internally, and is even recommended as a remedy in gastric disorders. While, during my late expedition in the interior of Guiana, I was suffering under all the horrors of a tertian ague, and our quinine had fallen short, I took frequently the Urari in doses of about as much as I could get on the point of the knife. After having taken it I felt generally a slight head-ache, but it did not remove the fever; and fearing there might be an excoriation of the tongue or throat, or bleeding of the gums, without being aware of it, my companions induced me to desist from the dangerous experiment. The Indian when he purchases the poison tastes it, in order to judge of its genuineness. It is well ascertained, also, that animals shot with the Urari are more savoury when prepared for food, and the meat is quite innocent. Generally, the game which we received from the Indians was killed with the poisoned arrow, and we never hesitated to eat of it. Dissection of those who have died of the nux vomica shows no organic lesions, which is likewise the case where death has been produced by the Urari coming in contact with the blood. The first is proved by numerous experiments of M. Orfila; the

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Sir Walter Raleigh says, in his second Guiana voyage, "There was nothing whereof I was more curious than to find out the true remedies of these poisoned arrows. . . . And it is more strange to know that in all this time there was never Spaniard, either by gift or torment, that could attain to a true knowledge of the cure, although they have martyred and put to invented torture I know not how many of them." Raleigh recommends garlic as an antidote where the wound has been inflicted with an arrow of the ordinary poison, and advises them to abstain from drink, "for if they take any liquor into their body, as they shall be marvellously provoked thereunto by drought, I say, if they drink before the wound be dressed, or soon upon it, there is no way with them but present death." Irai, a Carib chieftain of the Rupununi, and the last descendant in direct line of the Cacique Mahanarawa, so far confirms Raleigh's account, that the thirst which ensues after a wound has been inflicted is intolerable. He pretended that the infusion from the root of a species of *Wallaba* (*Dimorpha*, W.), mixed with sugar, or the juice of sugar-cane, was an antidote. There is not much dependence to be placed on this remedy. While in Curasawake in 1838, we secured several Kings of the Vultures (*Sarcorhamphus Papa*) alive. A female which we had for several weeks succeeded in escaping out of the place where she was kept, and flew to a neighbouring tree. I was loath to lose her, and resolved to shoot her with weakened *Urari* poison. It took effect, and she fell from the tree. We immediately applied juice of the sugar-cane, but without avail; and after having lingered for half an hour, she died under convulsions. Humboldt observes, that an application of salt internally and to the wound would be found of importance; and Mr. Waterton informs us, that an ass which was poisoned by *Wourali* recovered by inflating his lungs with a pair of bellows*. In the 'Annals of Philosophy,' vol. xv. p. 389, we

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latter by those of Mr. Waterton in England, and several physicians in Demerara. The juice of the *Cassada* becomes innocent by being boiled, that of the *Urari* becomes poisonous after it has been concentrated by the action of fire: should the poisonous principle of the *Jatropha manihot* be entirely volatile? The *Cassaripe* is the concentrated juice of the *Jatropha manihot*, and is used as fish-sauce and for many culinary purposes, while in its pure state it proves poisonous to animal life; what then can cause the difference? I am not aware whether experiments have been made by inoculating animals with the juice of the *nux vomica* in its pure state, and likewise after having been concentrated.

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